

CLAIMS

What is claimed is:

1. An apparatus for joining a plurality of cylindrical sections together, comprising:
 - a plug assembly having a plurality of splines;
 - a socket assembly having a plurality of receptacles adapted to receive the plurality of splines of the plug assembly;
 - a securing device for securing the plug assembly to the socket assembly;
 - wherein the plug assembly and the socket assembly may be joined in N orientations where N is equal to the number of splines.
2. The apparatus of claim 1, wherein the plurality of splines further comprises a center spline and a plurality of outer splines of equal dimensions, the outer splines sharing a common longitudinal axis with the center spline and having symmetry about the common longitudinal axis, and where N is equal to the number of outer splines.
3. The apparatus of claim 1, wherein the securing device is a coupling collar adapted for connecting it to the plug assembly and the socket assembly, the coupling collar initially engaged with the plug assembly.
4. The apparatus of claim 1, wherein the plug assembly further comprises fine threads.
5. The apparatus of claim 1, wherein the socket assembly further comprises coarse threads.
6. The apparatus of claim 5, wherein the threads of the socket assembly are tapered.
7. The apparatus of claim 1, wherein the cylindrical sections are connectable in two distinct orientations.
8. The apparatus of claim 1, wherein the cylindrical sections are connectable in three distinct orientations.

9. The apparatus of claim 1, wherein the cylindrical sections are connectable in four or more distinct orientations.
10. The apparatus of claim 1, further comprising at least one conduit containing a wire adapted to carry an electrical current.
11. The apparatus of claim 1, further comprising at least one conduit containing material adapted to carry an optical signal.
12. The apparatus of claim 1 wherein the cylindrical sections are tubing.
13. The apparatus of claim 1 wherein the cylindrical sections are pipe.
14. The apparatus of claim 1 wherein the cylindrical sections are casing.
15. The apparatus of claim 1 wherein the cylindrical sections are used to produce hydrocarbons from a well bore.
16. The apparatus of claim 1 wherein the cylindrical sections are used to produce water from a well bore.
17. The apparatus of claim 1 wherein the cylindrical sections are connectable in a plurality of distinct orientations.
18. An apparatus for providing power to a subterranean environment, comprising:
 - a drilling assembly containing a plurality of cylindrical sections;
 - a plurality of cylindrical joints for connecting the plurality of cylindrical sections together, the cylindrical joints comprising:
 - a plug assembly having a plurality of splines;
 - a socket assembly having a plurality of receptacles, the plurality of receptacles adapted to receive the plurality of splines of the plug assembly;

at least one conduit running the length of the apparatus;
a securing device for securing the plug assembly to the socket assembly; and
wherein the plug assembly and the socket assembly may be joined in N orientations where N
is equal to the number of splines.

19. The apparatus of claim 18, wherein the plurality of splines further comprises a center spline and a plurality of outer splines of equal dimensions, the outer splines sharing a common longitudinal axis with the center spline and having symmetry about the common longitudinal axis, and wherein N is equal to the number of outer splines.
20. The apparatus of claim 19, wherein the securing device is a coupling collar adapted for connection to the plug assembly and the socket assembly, the coupling collar initially engaged with the plug assembly.
21. The apparatus of claim 19, wherein the plug assembly further comprises fine threads.
22. The apparatus of claim 19, wherein the socket assembly further comprises coarse threads.
23. The apparatus of claim 22, wherein the threads of the socket assembly are tapered.
24. The apparatus of claim 19, wherein the cylindrical sections are connectable in two distinct orientations.
25. The apparatus of claim 19, wherein the cylindrical sections are connectable in three distinct orientations.
26. The apparatus of claim 19, wherein the cylindrical sections are connectable in four or more distinct orientations.
27. The apparatus of claim 19, further comprising at least one conduit containing a wire adapted to carry an electrical current.

28. The apparatus of claim 19, further comprising at least one conduit containing material adapted to carry an optical signal.
 29. The apparatus of claim 19 wherein the cylindrical sections are tubing.
 30. The apparatus of claim 19 wherein the cylindrical sections are pipe.
 31. The apparatus of claim 19 wherein the cylindrical sections are casing.
 32. The apparatus of claim 19 wherein the cylindrical sections are used to produce hydrocarbons from a well bore.
 33. The apparatus of claim 19 wherein the cylindrical sections are used to produce water from a well bore.
 34. The apparatus of claim 19 wherein the cylindrical sections are connectable in a plurality of orientations.
35. A method of using a cylindrical joint to join two cylindrical sections together, comprising:
using a first cylindrical section with a proximate end having a plug assembly attached and
a second cylindrical section with a distal end having a socket assembly attached, positioning the
first cylindrical section coaxially with the second cylindrical section;
aligning the first cylindrical section with the second cylindrical section;
engaging the plug assembly of the first cylindrical section into the socket assembly of the
second cylindrical section; and
securing the first cylindrical section to the second cylindrical section.
36. The method of claim 35 wherein the positioning step further comprises: positioning the first
cylindrical section coaxially with the second cylindrical section such that the proximate end of

the first cylindrical section is in close proximity with the distal end of the second cylindrical section.

37. The method of claim 35 wherein the positioning step further comprises:

38. The method of claim 35 wherein the first cylindrical section is vertically above the second cylindrical section.

39. The method of claim 35 wherein a pair of electrical connectors are electrically coupled when the plug assembly of the first cylindrical section is inserted into the socket assembly of the second cylindrical section.

40. The method of claim 35 wherein a pair of optical connectors are optically coupled when the plug assembly of the first cylindrical section is inserted into the socket assembly of the second cylindrical section.

41. The method of claim 35 wherein the coupling collar of the first cylindrical section is used to secure the first cylindrical section to the second cylindrical section.

42. The method of claim 35 wherein the cylindrical sections are tubing.

43. The method of claim 35 wherein the cylindrical sections are pipe.

44. The method of claim 35 wherein the cylindrical sections are casing.

45. The method of claim 35 wherein the cylindrical sections are used to produce hydrocarbons from a well bore.

46. The method of claim 35 wherein the cylindrical sections are used to produce water from a well bore.

47. In a drill string of the type comprising a plurality of cylindrical sections arranged in end to end relation from a location above the ground to a lower location adjacent to an orientable tool connected to a bottom end of the drill string and wherein the adjacent ends of the cylindrical sections are connected to each other to form a plurality of spaced cylindrical joints extending downwardly from the ground to the tool, wherein each cylindrical section is provided with a lower end having a downwardly projecting extension and an upper end having a complementary recess which is in alignment with and corresponds with the downwardly projecting extension on the lower end of the same cylindrical section, and wherein each cylindrical joint comprises an upper cylindrical section having its downwardly projecting extensions received in the corresponding recess in the next adjacent lower cylindrical section and wherein the extensions and the recesses can fit together in more than one orientation, wherein the adjacent ends of the sections are threaded and wherein an internally threaded collar is received over the threaded ends to hold the sections of each cylindrical joint securely together.

48. A cylindrical joint as set forth in claim 47 wherein the upper cylindrical section and lower cylindrical section are provided with keyways which are symmetrically related with respect to the longitudinal axis of the drill string and wherein keys are affixed to the keyways of the upper drill section and are adapted to fit into the keyways of the lower cylindrical section.

49. A cylindrical joint as set forth in claim 47 wherein the upper cylindrical section is provided with at least three downwardly extending legs which are symmetrically arranged with respect to the longitudinal axis of the drill string and wherein the lower cylindrical section is provided with

a corresponding number of recesses arranged so as to receive the legs of the upper cylindrical section.

50. An apparatus for connecting a plurality of cylindrical sections together comprising:
- a first cylindrical section;
 - a second cylindrical section removably connected to the first cylindrical section; and
 - wherein the first cylindrical section and the second cylindrical section are connectable in a plurality of distinct orientations.
51. The apparatus of claim 50 wherein the connection between the first cylindrical section and the second cylindrical section comprises: a means for connecting the first cylindrical section to the second cylindrical section in a plurality of distinct orientations.
52. The apparatus of claim 50 wherein the connection between the first cylindrical section and the second cylindrical section comprises:
- a plug assembly having a plurality of splines affixed to the first cylindrical section;
 - a socket assembly having a plurality of receptacles adapted to receive the plurality of splines of the plug assembly, the socket assembly being affixed to the second cylindrical section; and
 - a securing device for securing the plug assembly to the socket assembly.
53. The apparatus of claim 52, wherein the securing device is a coupling collar adapted for connection to the plug assembly and the socket assembly, the coupling collar initially engaged with the plug assembly.
54. The apparatus of claim 53, wherein the plug assembly further comprises fine threads.
55. The apparatus of claim 53, wherein the socket assembly further comprises coarse threads.

56. The apparatus of claim 55, wherein the threads of the socket assembly are tapered.
57. The apparatus of claim 52, wherein the cylindrical sections are connectable in two distinct orientations.
58. The apparatus of claim 52, wherein the cylindrical sections are connectable in three distinct orientations.
59. The apparatus of claim 52, wherein the cylindrical sections are connectable in four or more distinct orientations.
60. The apparatus of claim 52, further comprising at least one conduit containing a wire adapted to carry an electrical current.
61. The apparatus of claim 52, further comprising at least one conduit containing material adapted to carry an optical signal.
62. The apparatus of claim 52 wherein the cylindrical sections are tubing.
63. The apparatus of claim 52 wherein the cylindrical sections are pipe.
64. The apparatus of claim 52 wherein the cylindrical sections are casing.
65. The apparatus of claim 52 wherein the cylindrical sections are used to produce hydrocarbons from a well bore.
66. The apparatus of claim 52 wherein the cylindrical sections are used to produce water from a well bore.
67. The apparatus of claim 1 wherein the cylindrical sections are rods.
68. The apparatus of claim 19 wherein the cylindrical sections are rods.
69. The method of claim 35 wherein the cylindrical sections are rods.
70. The apparatus of claim 52 wherein the cylindrical sections are rods.